Return-to-Driving Recommendations After Lower-Extremity Orthopaedic Procedures

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Abstract

» Following lower-extremity orthopaedic surgery, recommendations for safe return to driving include at least 6 to 12 weeks for a right ankle fracture, 2 days to 2 weeks for a right ankle arthroscopy, 6 to 9 weeks for a total ankle arthroplasty, 6 to 7 weeks for a right Achilles tendon rupture repair, 1 to 4 weeks for a right total knee arthroplasty, 2 weeks for a left total knee arthroplasty, 3 to 6 weeks for a right anterior cruciate ligament repair, and 1 to 4 weeks for a total hip arthroplasty.

» Important individual factors such as extent of injury, laterality of injury, current driving habits, type of vehicle transmission (manual or automatic), and medical comorbidities must be taken into consideration.

» State laws vary widely and often use vague language to describe the legal responsibilities that orthopaedic surgeons have when providing return-to-driving recommendations.

Orthopaedic surgeons are tasked with determining when it is safe for their patients to return to driving, an activity that is instrumental for some patients to continue their daily life. A lack of formal recommendations from major orthopaedic societies makes this an arduous decision[1]. Recommendations must be individualized, carefully considering the patient's presurgical driving ability, the extent of injury, the laterality of injury, use of medications, and type of vehicle transmission (manual or automatic). Medical comorbidities such as cardiovascular and cerebrovascular disease, dementia, ophthalmologic disease, and epilepsy also alter a patient's ability to drive[2].

The regulations and recommendations from U.S. state and federal agencies are vague and not explicit. Sandvall and Friedrich investigated the Department of Motor Vehicles Handbook for every U.S state; they found no specific guidelines or statutes[3]. Sansosti et al. further investigated these regulations; they found variation in the guidelines, which often used vague language such as "may" and "if" when discussing restrictions, as well as "careless," "reckless," and "negligent" when discussing automobile operation[4]. However, they did find some exceptions. Connecticut, Maine, and Vermont were the only states that discussed the wearing of a cast or an orthotic boot as a potential restriction; however, no explicit restrictions were mentioned. Oregon and Pennsylvania require physicians to report potentially impaired drivers, which is in contrast to most states that provide physicians with civil and criminal immunity with regard to reporting potentially impaired drivers. The American Association of Motor Vehicle Administrators, in conjunction with the National Highway Traffic Safety Administration, issued a Driver Fitness Medical Guidelines

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statement that highlights the impact on vehicle operation of various medical conditions[5]. However, the only orthopaedic procedure for which they published a recommendation was return to driving at 4 to 6 weeks after anterior cruciate ligament (ACL) surgery.

A basic understanding of the different experimental surrogates that currently are used to evaluate a patient's ability to return to driving will help in the comprehension of the information that is presented in this article. The current literature discusses several methods, including driving simulators, braking simulators, patient questionnaires, and scores. Outcome measures such as brake force, initial reaction time (IRT), foot movement time (FMT), brake reaction time (BRT), brake travel time (BTT), and total brake time (TBT), among many others, are some of the common measurements that are used throughout the literature[6,7]. Figure 1 provides a visual representation of these measures. The most widely used parameter is BRT, defined by the time between a visual stimulus and the application of pressure on the brake pedal[8]. However, it does not come without its limitations. BRT is divided into IRT and FMT. IRT is dependent on ophthalmologic and neurologic factors as well as alertness. FMT is dependent on range of motion, whether or not brace is being worn, and amount of pain. The medical literature considers a safe BRT to be <700 milliseconds[9], but other recommendations consider 700 milliseconds to be inaccurate because of driver expectation of a stimulus, and therefore consider a reaction time of 1.25 to 1.50 seconds to be more accurate for surprise events[10]. Additionally, there is a variation in BRT among the normal healthy population[11]. Although objective data are desired, obtaining them may not be practical in a clinical setting. As a result, there has been a recent exploration of validated survey methods for predicting safe return to driving. Compared with objective response-time measurements, surveys can be administered at low cost and even at home. Recently, McDonald et al. published a novel 3-question survey to predict BRT passing rates (set at <850 milliseconds) following 3 procedures: Achilles rupture repair, total ankle arthroplasty (TAA), and hallux valgus correction[12]. The survey and BRT measurements were performed at 6 weeks postoperatively. Because the test demonstrated an under the receiver operating characteristic curve area of 94%, it had excellent accuracy in predicting a passing BRT in a subject who scored ≥10 of 15 points.

Naturally, the lack of societal recommendations against the backdrop of vague legal considerations has sparked the interest of the orthopaedic community. The aim of this article was to gather evidence, inform, and provide general recommendations based on the most recent high-quality literature on driving recommendations after lower-extremity orthopaedic procedures. Our decision to review certain procedures over others was based on the popularity of the procedure, the extent of prior literature on the subject, and the existence of recently published studies. Tables I, II, and III summarize the literature that is reviewed below.

Foot and Ankle

Ankle Fractures

In 2003, Egol et al. investigated the effect of a right ankle fracture on the ability to depress the brake pedal[13]. A

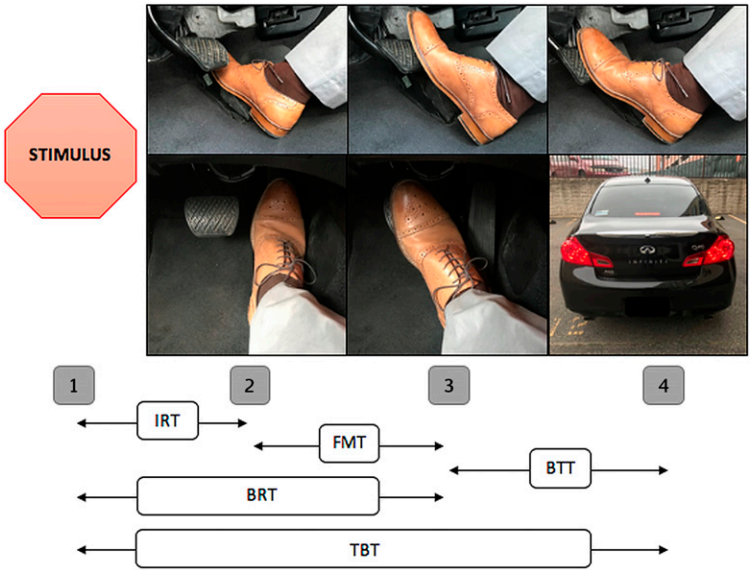

Fig. 1

Commonly used objective measures that are referenced in return-to-driving studies. IRT = initial reaction time, FMT = foot movement time, BTT = brake travel time, BRT = brake reaction time, and TBT = total brake time.

TABLE I Studies Investigating Return to Driving After Foot and Ankle Procedures*

Study	Injury/Procedure	No. of Patients	Comparison	Evaluation Method	Return-to-Driving Recommendation	Level of Evidence†
Egol et al. (2003)[13]	Right ankle fractures	31 operative	11 healthy volunteers	TBT	9 wk postoperatively	2b
Kane et al. (2003)[14]	Right ankle fractures	7 operative; 18 nonoperative	Age, sex, and driving experience with matched controls	BRT	2 wk after cast removal for nonoperative group; 4 wk after cast removal for operative group	2b
Ho et al. (2018)[15]	Right ankle fractures	23 operative	Off-road and on-road nationalized licensing examination	BRT	91% within 6 wk; 100% by 12 wk	2b
Yousri and Jackson (2015)[16]	Right ankle fractures	7 operative; 5 nonoperative	Contralateral uninjured limb	BRT, brake force	After cast removal at 52 days postoperatively	2b
Liebensteiner et al. (2016)[17]	Right ankle arthroscopy	19	Preoperative measurement	BRT	2 days to 2 wk postoperatively depending on preoperative driving frequency	2b
Sittapairoj et al. (2017)[18]	Right ankle arthroscopy	17	Preoperative measurement	BRT	2 wk postoperatively	2b
McDonald et al. (2020)[19]	TAA	59	20 healthy volunteers	BRT	6-9 wk postoperatively	2b
Jennings et al. (2004)[21]	Achilles tendon rupture repair	30	NA	Survey	7 wk postoperatively	4
Beck et al. (2016)[22]	Right Achilles tendon rupture repair	50	20 healthy volunteers	BRT	6-7 wk postoperatively	2b
Reb et al. (2020)[23]	Right Achilles tendon rupture repair	60	Preset BRT cut-off value (850 ms)	BRT	6-7 wk postoperatively	2b

*TBT = total brake time, BRT = brake reaction time, TAA = total ankle arthroplasty, and NA = not applicable. †Oxford Centre for Evidence-Based Medicine.

healthy cohort served as a control group to determine a normal TBT. The fracture group consisted of patients with 14 isolated malleolar, 9 bimalleolar, and 8 trimalleolar fractures; the patients were evaluated at 6, 9, and 12 weeks postoperatively. They found that TBT in the fracture group returned to normal by the ninth week. The entirety of the changes in TBT stemmed from faster BTT, defined as the time elapsed between the moment of initial foot contact with the brake and the moment that the brake pedal reaches the end of its travel and is completely depressed[13]. They found no difference in the IRT or FMT (together referred to as BRT) across the testing dates, suggesting that depression of the brake pedal might be the most important factor within these parameters. Additionally, they found no significant correlation between improvement scores on the Short Musculoskeletal Function Assessment and TBT.

In the same year, Kane et al. performed a similar study evaluating the time to return to normal BRT in patients with a right ankle fracture[14]. A healthy cohort served as a control to determine a normal BRT. The fracture group consisted of 7 operative cases and 18 nonoperative cases. They found that BRT had not returned to normal values by the date of cast removal for either group. The nonoperative and operative subgroups returned to normal BRT within 2 weeks and 4 weeks after cast removal, respectively. The authors, however, did not report on which postoperative or postinjury days the casts were removed.

Ho et al. conducted a study involving an off-road assessment of BRT, followed by an on-road national standardized driving examination[15]. The study included 23 patients with a right ankle fracture who were evaluated at 2, 6, and 12 weeks postoperatively. The first of 2 tests was an off-road assessment that evaluated objective and subjective measures such as BRT, a physical examination, and a visual analog scale (VAS) pain score, among others. The second test was an on-road assessment that was typical of an examination to obtain a driver's license. Ninety-one percent of patients passed the off-road and on-road assessments on their first attempt at 6 weeks. The remaining 9% who had failed the off-road assessment on the first attempt passed both assessments at 12 weeks postoperatively.

Yousri and Jackson investigated brake force application and reaction time in 12 patients with surgically and nonsurgically treated right ankle fractures[16]. The authors also validated the use of the healthy contralateral limb as a control for their simulation setup. Brake

TABLE II Studies Investigating Return to Driving After Knee Procedures*

Study	Injury/ Procedure	No. of Patients	Comparison	Evaluation Method	Return-to-Driving Recommendation	Level of Evidence†
Hartman et al. (2018)[32]	TKA	330	Preoperative measurement	BRT	4 wk postoperatively for right-sided TKA; 2 wk postoperatively for left-sided TKA	2a
van der Velden et al. (2017)[33]	TKA	566	45 healthy volunteers	BRT	4 wk postoperatively for right-sided TKA	2a
Davis et al. (2018)[28]	Right TKA	32	Preoperative measurement	BRT	1 wk postoperatively for men; 2 wk postoperatively for women	2b
Dalury and Chapman (2019)[34]	Right TKA	40	Preoperative measurement	BRT	2-3 wk postoperatively	2b
Rondon et al. (2020)[35]	Primary TKA	554	NA	Survey	4 wk postoperatively	4
Wasserman et al. (2017)[38]	Right ACL reconstruction	27	30 healthy volunteers	BRT, BTT, TBT	3 wk postoperatively for TA allograft; 6 wk postoperatively for BTB or HS autograft	3b
Valenti et al. (2018)[39]	ACL reconstruction	31	31 healthy volunteers	BRT, BTT, TBT	4-6 wk postoperatively	2b

*TKA = total knee arthroplasty, BRT = brake reaction time, NA = not applicable, BTT = brake travel time, TBT = total brake time, TA = tibialis anterior, BTB = bone-patellar tendon-bone, and HS = hamstring. †Oxford Centre for Evidence-Based Medicine.

force application was tested between 0 and 35 kg of force in 5-kg increments for 5 seconds to simulate fine control of the brake pedal. Most patients were evaluated on the day of cast removal, which was, on average, after 52 days. Their results showed that all of the patients were able to tolerate 35 kg of force with an average VAS pain score of 1.5. Additionally, they found no difference between the reaction time with use of the injured leg compared with the healthy contralateral leg. This suggests that patients can react to and tolerate pain during emergency braking situations soon after cast removal.

Ankle Arthroscopy

In 2016, Liebensteiner et al. recruited 19 patients who underwent right-sided ankle arthroscopy; they evaluated their BRT preoperatively and at several postoperative visits[17]. They found that BRT was 606 ± 148 milliseconds preoperatively, was 821 ± 351 milliseconds on postoperative day 2, and normalized to 606 ± 180 milliseconds by the second week postoperatively. Their findings suggested that patients who underwent right-sided ankle arthroscopy could safely return to driving at 2 weeks postoperatively. Interestingly, they found a correlation between patient-reported frequency of driving and normalization of BRT. Patients who reported that they drive "often" or "very often" had a faster BRT across all postoperative visits than patients who reported driving "sometimes," "seldom," or "never." This was most relevant on postoperative day 2, when frequent drivers had a nearly normalized BRT (631 milliseconds) compared with infrequent drivers (807 milliseconds). Of note, the frequent drivers' BRT was below the recommended safe BRT of 700 milliseconds[10]. The authors concluded that clinicians should adjust their recommendations based on the patient's self-reported driving frequency.

TABLE III Studies Investigating Return to Driving After Hip Procedures*

Author	Injury/ Procedure	No. of Patients	Comparison	Evaluation Method	Return-to-Driving Recommendation	Level of Evidence†
van der Velden et al. (2017)[33]	THA	721	103 healthy volunteers	BRT	2 wk postoperatively for right-sided THA	2a
Qurashi et al. (2017)[41]	THA	100	Preoperative	BRT	2 days postoperatively	2b
Batra et al. (2018)[42]	THA	212	NA	Survey	1 wk postoperatively (14%) 2 wk postoperatively (39%) 3 wk postoperatively (23%)	4
Rondon et al. (2020)[35]	THA	490	NA	Survey	3-4 wk postoperatively	4

*THA = total hip arthroplasty, BRT = brake reaction time, and NA = not applicable. †Oxford Centre for Evidence-Based Medicine.

A similar study by Sittapairoj et al. in 2017 investigated the effects of right-sided ankle and subtalar arthroscopy on BRT in 17 patients[18]. They found that the BRT of the treatment group returned to preoperative values at 2 weeks postoperatively, and that these values were not significantly different from the BRT of the control group. They also reported no differences in outcomes between anterior and posterior arthroscopic procedures.

The presented evidence suggests that patients undergoing right-sided ankle arthroscopy may return to driving at 2 weeks postoperatively[17,18]. However, actual safe return to driving may be possible prior to the 2-week mark according to the patient's self-reported driving frequency[17].

Total Ankle Arthroplasty

To date, to our knowledge, there has been only 1 study investigating the safe return to driving after TAA. McDonald et al. investigated the effects of TAA on 59 patients' ability to return to driving using BRT as a surrogate[19]. Additionally, they investigated correlations between ability to drive and ankle range of motion, VAS, the American Orthopaedic Foot & Ankle Society Ankle-Hindfoot Scale (AOFAS AHS) score, and a driver-readiness survey. They reported that 92% of the patients returned to their BRT within 6 weeks, with the average BRT being 626 milliseconds. They reported a positive correlation of patients who did not return to normal BRT within 6 weeks and decreased plantar flexion, higher VAS scores, and less confidence regarding patient-reported readiness to drive. The authors found no differences in dorsiflexion or AOFAS AHS[20]. Of the patients who did not have normalization of BRT at 6 weeks, they had a return to normal BRT at 9 weeks postoperatively. The final recommendation was for clinicians to advise patients to wait until at least 6 weeks postoperatively for safe return to driving.

Achilles Tendon Rupture Repair

To date, there have been few studies investigating the effects of Achilles tendon rupture on a patient's return to driving. A study by Jennings et al. in 2004 evaluated the return of function in 30 patients after open Achilles tendon repair[21]. Although they did not report any objective measures or factors across their treatment cohort that contributed to the ability to drive, they did report the average return to driving to be 7 weeks. More recent prospective investigations have reported similar outcomes that have been supported with objective data.

In 2016, Beck et al. investigated the normalization of BRT in 50 patients after open right Achilles tendon repair[22]. The patients were evaluated after 6 weeks of rehabilitation, which allowed for progressive range of motion to full weight-bearing. Ninety-four percent of their patient cohort had a BRT of 658 milliseconds, well within safe BRT recommendations. In a driver-readiness survey, 100% of the patients who had a safe BRT at 6 weeks felt that they were ready to return to driving. The remaining 6% of patients had a return of BRT to safe limits at 7 weeks postoperatively.

In 2020, Reb et al. conducted a similar study with 60 adult patients who drove at least 4 times a week[23]. At 6 weeks postoperatively, 92% of patients had a BRT of <850 milliseconds, and at 7 weeks postoperatively, the remaining patients had a BRT of <850 milliseconds. These patients were also given driver-readiness[12] and Achilles tendon Total Rupture Score (ATRS)[24] surveys at their postoperative visits. The authors reported a high correlation of the driver-readiness survey and the ATRS survey with the normalization of BRT to safe values. One limitation of this investigation was that the demographic was 80% male and the results thus may not be generalizable to the female population.

The consistent findings across these 3 studies show that patients with open right Achilles tendon rupture repair may return to driving at 6 weeks postoperatively. A patient's confidence with regard to driving should be taken into consideration when making recommendations, as Beck et al.[22] and Reb et al.[23] reported that driver-readiness surveys have a high correlation with the normalization of BRT values.

Knee

Total Knee Arthroplasty

Total knee arthroplasty (TKA) is one of the most common surgical procedures worldwide, with an expected dramatic rise in the future[25]. Patients have high preoperative expectations for TKA with regard to their outcomes and ability to return to normal activities of daily living.[26,27]. A quick recovery and return to preoperative function reduce social isolation because patients are able to attend social and vocational events[28]. One major concern is the ability to return to driving. Previous studies have recommended a wait of at least 6 weeks postoperatively before return to driving[29,30]; however, with the advances in preoperative and postoperative management, surgical technique, pain relief, and physical rehabilitation[31], these guidelines have been reevaluated.

Hartman et al. conducted a systematic review that included 330 patients from 9 studies from 1994 to 2016[32]. The mean BRT was 850 milliseconds preoperatively, 859 milliseconds at 0 to 4 weeks postoperatively, and 607 milliseconds at >4 weeks postoperatively. Subgroup analysis of right-sided TKA showed a substantial change in BRT from 984 milliseconds preoperatively to 988 milliseconds at 0 to 4 weeks postoperatively and 604 milliseconds at >4 weeks postoperatively. Patients with left-sided TKA showed no significant change in BRT in the same time windows. Their findings reflected a return to preoperative BRT by 4 weeks in patients who underwent right-sided TKA and by 2 weeks in patients who underwent left-sided TKA, with an extension to 4 weeks if the vehicle had a manual transmission. Van der Velden et al. performed a meta-analysis of 16 studies from 1994 to 2015 that yielded similar results[33], corroborating the findings by Hartman et al[32].

More recent evidence from Davis et al. (2018)[28] and Dalury and Chapman (2019)[34] suggested an earlier return to driving than reported previously in the literature. Dalury and Chapman investigated 40 patients undergoing primary right-sided TKA. Ninety percent of their patients returned to preoperative BRT by 2 weeks, with the remaining patients reaching a normal BRT by the third week. However, their study had considerable limitations. The driving simulator that was used did not accurately represent the ergonomic design of a car cabin, and thus may not have replicated the natural range of motion of the knee in a natural braking response. Additionally, because 30 of 40 patients were women, the results may not be applicable to the general population. Davis et al. did find a difference in time to BRT normalization between the sexes when studying the BRT of 32 patients preoperatively through 8 weeks postoperatively. They found that men return to their preoperative BRT within 1 week, while women return to their preoperative BRT within 2 weeks. Additionally, they found no difference in BRT in patients who had a left-sided TKA.

Rondon et al. presented prospective patient-reported survey data on predictors of patient return to driving after 554 TKA cases[35]. They reported that the mean return to driving was 4 weeks postoperatively. The predictors that led to a faster return to driving were feeling safe to return to driving (−2.8 days) and male sex (−2.1 days). The predictors that led to additional time for return to driving were not feeling safe to drive (+2.8 days), limited range of motion (+2.5 days), female sex (+2.2 days), limitations due to pain (+2.2 days), discharge to a rehabilitation facility (+1.8 days), right-sided procedures (+1.7 days), limited ability to brake (+1.7 days), preoperative anemia (+1.6 days), and preoperative cane use (+1.3 days). These predictors may help surgeons personalize their recommendations for returning to drive.

Anterior Cruciate Ligament Reconstruction

To our knowledge, the earliest studies investigating safe return to driving after ACL reconstruction were conducted in 2000 and recommended that patients should return to driving at 4 to 6 weeks postoperatively[36,37]. Since then, there have been advances in surgical technique, preoperative and postoperative management, and perioperative analgesia protocols, which might alter the outcomes.

Wasserman et al. evaluated 27 patients with safe driving parameters who underwent isolated acute right-sided ACL reconstruction and were treated with bone-patellar tendon-bone (BTB) autograft, hamstring (HS) autograft, or tibialis anterior (TA) allograft[38]. They reported that the earliest normalization of every braking parameter (BRT, BTT, and TBT), compared with a control group, was in the TA allograft subgroup at 3 weeks postoperatively. The BTB and HS autograft groups had a significantly longer BTT, suggesting that autograft use affects the ability to completely depress the brake pedal. By 6 weeks postoperatively, the BTB and HS autograft subgroups had normalized all of the braking parameters when compared with the control group.

More recently, in 2018, Valenti et al. compared subjective and objective outcomes between a healthy control group and an ACL reconstruction group[39]. Both groups were evaluated at 4 to 6 weeks (with an average of 5.3 weeks). The ACL group contained patients with right or left-sided ACL reconstruction, and half had treatment of associated lesions such as meniscal repair and partial meniscectomies. The patients were evaluated on several subjective and objective measures; however, the most relevant measures were the visual simulation test, which evaluated BRT, BTT, and TBT, and the driver simulation test, which simulated driving with a manual transmission in several environments with normal obstacles and emergency situations. The authors reported no differences in BRT, BTT, or TBT between the 2 groups on the visual simulation test. Additionally, they reported no significant differences between the groups regarding testing date, number of motor-vehicle collisions, collisions with fixed objects or pedestrians, red-light traffic violations, sidewalk violations, or quantity and duration of brake usage in normal or emergency scenarios. Their results strengthen the findings of the earliest studies and support that patients with ACL reconstruction are able to react and return to driving at 4 to 6 weeks postoperatively.

Hip

Total Hip Arthroplasty

Total hip arthroplasty (THA) is one of the most successful and common orthopaedic surgeries performed today, with >370,000 THAs done each year in the U.S. alone[25]. Previous studies have recommended return to driving as soon as 2 weeks following right-sided THA[40]; however, surgical advances may alter recovery time.

In 2017, a meta-analysis by van der Velden et al. summarized that patients seem to be able to perform emergency braking at 2 weeks after right-sided THA[33]. They found that BRT returned to preoperative values within 2 weeks postoperatively. Additionally, they reported that BRT continued to improve to lower values than the preoperative values at the 6-week mark. Unsurprisingly, they found that total break response time was not affected by left-sided THA; however, they suggested caution since the evidence for left-sided THA is scarce. The authors did not attempt to stratify their results by surgical approach because the range of approaches in the referenced studies was too heterogeneous.

A study by Qurashi et al. that investigated 100 patients who underwent microinvasive THA with the SuperPATH (supercapsular percutaneously assisted total hip) technique reported that BRT returns to preoperative levels by 2 days postoperatively[41]. Ninety-three percent of patients matched their average preoperative BRT, and 92% showed an

improvement over their best preoperative BRT within 2 days postoperatively. The patients who were tested at 2 weeks continued to show improvement in mean and best BRT values. This indicates that patients undergoing THA with the SuperPATH technique may resume driving sooner than those who undergo THA by traditional approaches. Comparative studies based on technique should be done to further confirm these findings.

Batra et al. took a more practical approach to determine how soon patients could resume driving[42]. The study included 212 patients who underwent a soft-tissue-sparing THA with a bikini incision. Seventy-six percent returned to driving within the first 3 weeks postoperatively: 14% of patients resumed driving within the first week, 39% resumed driving in the second week, and 23% resumed driving in the third week. Ninety-one percent of the patients stated that they were more comfortable driving postoperatively compared with preoperatively because they no longer had arthritic hip pain and stiffness. The study suggests that it is feasible and safe to resume driving within 1 week following THA with a bikini incision, regardless of laterality.

Rondon et al. presented data from a prospective patient-reported survey on predictors of patient return to driving after 490 THA cases across 3 surgical approaches: the direct anterior approach (57.3%), the direct lateral approach (28.4%), and the posterior approach (14.3%)[35]. They reported that the mean return to driving was 3.7 weeks postoperatively, with just 0.4% of these drivers having motor-vehicle accidents within 12 weeks after surgery. Surgical approach did not influence return to driving, which is consistent with findings from other studies that surgical approach does not affect return to driving[43]. The predictors that led to a faster return to driving were feeling safe to return to driving (−7.4 days) and male sex (−0.8 day). The predictors that led to additional time to return to driving were limited range of motion (+2.2 days), not feeling safe to drive (+2.8 days), limited ability to brake (+1.7 days), preoperative walker use (+1.6 days), preoperative cane use (+1.0 day), and right-sided procedures (+0.8 day). These predictors may help surgeons personalize their recommendations for returning to drive.

TABLE IV Recommendations for Return to Driving After Lower-Extremity Orthopaedic Procedures*

Injury/Procedure	Recommendation
Right ankle fracture[13-16]	6-12 wk
Right ankle arthroscopy[17,18]	2 days-2 wk
TAA[19]	6-9 wk
Right Achilles tendon rupture[21-23]	6-7 wk
Right TKA[28,32-35]	1-4 wk
Left TKA[32]	2 wk
Right ACL reconstruction[38,39]	3-6 wk
THA[33,35,41,42]	1-4 wk

*TAA = total ankle arthroplasty, ACL = anterior cruciate ligament, TKA = total knee arthroplasty, and THA = total hip arthroplasty.

Overview

The ability to drive safely after a musculoskeletal injury varies greatly across orthopaedic procedures. As evidenced by the previously reported studies, the ability to drive safely is multifactorial. Many other factors play a role, such as age, medical comorbidities, medication side effects, laterality of surgical site, frequency of driving, and prior driving ability. Studies investigating the return to safe driving after orthopaedic procedures often use BRT or other objective and subjective measures as surrogates to suggest recommendations. Although there is some evidence to support recommendations for specific orthopaedic procedures, the heterogeneity of these findings has not convinced national and international organizations to create official recommendations. In the absence of such recommendations and based on the presented literature and evidence, we have summarized our recommendations in Table IV. Nevertheless, the burden lies on the individual orthopaedic surgeon or clinician to further personalize recommendations for their patients. This burden, against the backdrop of medicolegal considerations, patient safety, and safety of other individuals on the road, has created a field that is difficult to navigate.

This article does have important limitations that should be considered. Because this field of investigation is relatively new for certain procedures, we felt that all of the presented literature was important. Consequently, the literature was not weighed or ranked when preparing our recommendations. Notably, some procedures were omitted from this article since no new literature has been published since the latest topic review. Other procedures were omitted since there have been only a few studies or a single investigation regarding these procedures. As a result, this article regarding safe postoperative return to driving is not comprehensive for all lower-extremity orthopaedic procedures. Another limitation is the lack of up-to-date literature on left-sided lower-extremity procedures, which is based on 2 reasons: (1) the right foot is used almost exclusively for routine and emergency braking, and (2) 2-pedal automatic transmission rather than 3-pedal manual transmission vehicles were prevalent in the countries where

the cited investigations were conducted. Additional investigations involving the use of left-sided procedures would likely assist surgeons in providing recommendations to their patients who operate a vehicle with a manual transmission.

We believe that the medicolegal concerns regarding these recommendations will continue to push surgeons, researchers, and organizations to develop and publish high-quality studies, thus instilling confidence in individual practitioners to make more frequent evidence-based recommendations.

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